Interpreting CAHSEE Scores for the March and May 2002 Administrations

To adequately interpret English Language Arts (ELA) and Mathematics test scores across administrations of the California High School Exit Examination (CAHSEE), the following statistical concepts need to be understood:

- ✓ Standard Error of Measurement
- ✓ Conditional Standard Error of Measurement
- ✓ Raw Score to Scale Score Conversion
- ✓ Weighting of Examination Portions

The sections that follow provide descriptions of these statistical concepts and how they apply to the CAHSEE.

Standard Error of Measurement

As with every test score, a student's score on the CAHSEE includes some uncertainty. While uncertainty can come from a variety of sources, the amount of uncertainty can be described by a statistic called the Standard Error of Measurement (SEM). Statisticians define the "error of measurement" as the difference between the score a student obtains on a test (an observed score) and the hypothetical "true score" that the same student would obtain if a test could measure the student's achievement level with perfect accuracy. Statistical theory indicates that a student will have an observed score within one SEM of his or her true score about 68 percent of the time and within two SEMs of his or her true score about 95 percent of the time.

Conditional Standard Error of Measurement

The SEM is not the same at all score levels. The Conditional Standard Error of Measurement (CSEM) is the SEM at a specific score level. Conditional Standard Errors of Measurement for scores near the top and bottom of the CAHSEE scale, for example, are typically larger than CSEMs near the middle of the scale around the passing score of 350. Stated simply, the scores in the middle of the scale are generally more accurate measures of student performance than the scores at the lower or higher ends of the scale. It is critical to have accuracy at the passing score because the CAHSEE is a high stakes exam.

Conditional standard errors of measurement at selected scaled scores on the CAHSEE Mathematics and ELA tests are provided for the March and May 2002 administrations at selected score points in Table 1 and Table 2, respectively.

To illustrate the CSEM principle, if a student achieves a score of 410 on the ELA test, we would be about 68 percent confident that his or her true score lies between 422 and 398, which is an interval on each side of his or her score equal to one CSEM. Similarly, we would be 95 percent confident that the student's true score lies between 434 and 386, which is a band around his or her score equal to two CSEMs.

Table 1: CAHSEE Scaled Scores: March 2002 Administration

ELA Scaled Score	CSEM		Math Scaled Score	CSEM
450	19		450	18
440	16		440	15
430	14		430	14
420	13		420	13
410	12		410	12
400	11		400	11
390	10		390	9
380	10		380	9
370	9		370	9
360	9		360	9
350	9		350	8
340	9		340	8
330	9		330	8
320	8		320	9
310	8		310	9
300	9		300	9
290	10		290	10
280	12		280	11
270	14		270	12
260	15		260	13
250	16		250	14

Raw Score to Scale Score Conversion

Students taking the CAHSEE have multiple opportunities to take the exam until they pass the English-Language Arts and Mathematics portions. When administering multiple forms of a test there is a need for a "constant scale." This means that the passing score must represent essentially the same level of achievement on all forms (variations) of the CAHSEE. To maintain comparability of scores across multiple test forms, number correct or raw scores are converted to scale scores. The raw score to scale score conversion reflects the relationship between difficulty of individual test items comprising each test forms and the constant measure of achievement indicated by the reported scale scores. For different test forms, the expected number correct score for a given level of achievement may vary somewhat due to (usually small) differences in the average difficulty of the questions in one form compared to the average difficulty of questions in other test forms. This is why the conversion tables for each test administration will differ slightly in relating number correct scores to scale scores. The procedure of converting the raw scores to scale scores is called score equating.

The CAHSEE scaled scores for ELA and Mathematics range from 250 to 450, with 350 being the score needed to pass each portion of the exam.

Table 2: CAHSEE Scaled Scores: May 2002 Administration

ELA Scaled Score	CSEM		Math Scaled Score	CSEM
450	17		450	19
440	16		440	16
430	14		430	14
420	13		420	13
410	12		410	12
400	11		400	11
390	10		390	10
380	10		380	9
370	9		370	9
360	9		360	9
350	9		350	8
340	9		340	8
330	9		330	8
320	8		320	9
310	9		310	9
300	9		300	9
290	10		290	10
280	12		280	11
270	14		270	12
260	15		260	13
250	16		250	14

Baseline conversions

The March 2001 CAHSEE serves as the baseline to which all future forms will be equated. Note, for example, the Mathematics raw score of 44 items answered correctly on the March test converts to the 350 scale score that reflects the minimum passing score of 55 percent correct approved by the State Board of Education. If you refer to the conversion table for mathematics in Table 3, you will note that for May 2001, the mathematics raw score of 46 items correct converts to the 350 scale score. This means that a student needed to get two more items correct on the May exam to be equivalent to getting 44 items (or 55 percent) correct in March. From this we can infer the items overall on the May exam were somewhat easier than on the March exam. The results for the March 2002 Mathematics exam are presented in Table 4. For both the March and May 2002 exams, Table 3 indicates that a student needed to get 45 items correct to achieve a passing score of 350.

The CAHSEE was designed to be an accurate measure of achievement in the score range from about 300 to 400 (350 being the passing score). This accuracy around the passing score is sufficient to equate test scores on one test form to another correctly and to reasonably interpret the “distance to passing.”

Table 3: CAHSEE Raw Score to Scale Score Conversions Mathematics, Spring 2001					
March	**Raw Score**	May	March	**Raw Score**	May
450	80	450	340	39	336
450	79	450	338	38	334
450	78	450	337	37	332
450	77	450	334	36	330
450	76	448	332	35	328
445	75	440	330	34	326
438	74	433	329	33	324
432	73	427	327	32	322
427	72	421	324	31	320
422	71	417	322	30	318
417	70	412	320	29	316
413	69	408	318	28	314
409	68	404	316	27	312
406	67	401	314	26	310
402	66	398	312	25	308
399	65	394	310	24	305
396	64	391	307	23	303
393	63	388	305	22	301
390	62	386	303	21	298
388	61	383	300	20	296
385	60	380	298	19	293
382	59	378	295	18	291
380	58	376	292	17	288
378	57	373	289	16	285
375	56	371	287	15	282
373	55	369	283	14	279
371	54	366	280	13	276
369	53	364	277	12	272
367	52	362	273	11	268
364	51	360	269	10	264
362	50	358	264	9	260
360	49	356	260	8	255
358	48	354	254	7	250
356	47	352	250	6	250
354	46 (pass)	350	250	5	250
352	45	348	250	4	250
350	44 (pass)	346	250	3	250
348	43	344	250	2	250
346	42	342	250	1	250
344	41	340	250	0	250
342	40	338			

Table 4: CAHSEE Raw Score to Scale Score Conversions Mathematics, Spring 2002					
March	**Raw Score**	May	March	**Raw Score**	May
450	80	450	338	39	338
450	79	450	336	38	336
450	78	450	334	37	334
450	77	450	332	36	332
450	76	450	330	35	330
444	75	443	328	34	328
437	74	436	325	33	326
431	73	430	323	32	324
425	72	425	321	31	322
420	71	420	319	30	320
416	70	415	317	29	317
412	69	411	315	28	315
408	68	407	312	27	313
405	67	404	310	26	311
401	66	400	308	25	309
398	65	397	306	24	306
395	64	394	303	23	304
392	63	391	301	22	302
389	62	388	298	21	299
386	61	386	295	20	297
384	60	383	293	19	294
381	59	380	290	18	291
379	58	378	287	17	289
376	57	375	284	16	286
374	56	373	281	15	283
372	55	371	278	14	279
369	54	369	274	13	276
367	53	367	271	12	272
365	52	364	267	11	269
363	51	362	263	10	264
361	50	360	258	9	260
359	49	358	253	8	255
356	48	356	250	7	250
354	47	354	250	6	250
352	46	352	250	5	250
350	45 (pass)	350	250	4	250
348	44	348	250	3	250
346	43	346	250	2	250
344	42	344	250	1	250
342	41	342	250	0	250
340	40	340			

Weighting Examination Portions (specifically the ELA scores)

The HSEE Standards Panel recommended that the reading and writing sections of the ELA portion of the spring 2001 CAHSEE be assigned equal weights (fifty percent each) in the calculation of each student's total ELA scale score. The Panel also recommended that the writing applications (essays) be weighted 30 percent and the multiple-choice items be weighted 70 percent of each student's total ELA scale score. To accomplish this technically in terms of the raw to scale score conversion, the test contractor used the following procedures:

1. The weight of .7683 was calculated for the Reading and Writing multiple-choice items. The 82 multiple-choice item scores are multiplied by this weight: 82 x .7683 = 63.

2. The weight of 3.375 was calculated for the average of the two scores for each essay. The maximum score on an essay is four, therefore the weight is multiplied by 8 (2 x 4): 3.375 x 8 = 27.

3. The weights were applied to the item raw scores.

4. The sum of the weighted multiple-choice and essay scores was rounded to the nearest whole number. The weighted raw scores are transformed to the ELA scale score.

The sum of steps 1 and 2 represent the range of the weighted ELA raw score, that is, 90. Refer to the ELA scale score conversions in Table 5 for March and May 2001 and in Table 6 for March and May 2002. For both March and May 2001 (Table 5), a student needed a weighted ELA raw score of 54 to achieve a minimum passing score of 350. For March 2002 (Table 6), a student needed a weighted ELA raw score of 51 to achieve a minimum passing score of 350 (the conversion actually results in a scale score of 351). For May 2002 (Table 6), a student needed a weighted ELA raw score of 49 to achieve a minimum passing score of 350 (the conversion actually results in a scale score of 349). Conversions may result in a scale score slightly different from 350when not every scale score point is used. By comparing Table 5 with Table 6, it can be seen that the March and May 2002 forms were more difficult than the March and May 2001 test forms.

Table 5: CAHSEE Raw Score to Scale Score Conversions English Language Arts, Spring 2001						
March	**Raw Score**	**May**		**March**	**Raw Score**	**May**
450	90	450		332	44	332
450	89	450		330	43	330
450	88	450		329	42	329
450	87	450		327	41	327
450	86	450		326	40	325
450	85	450		324	39	324
450	84	448		323	38	322
443	83	441		321	37	321
437	82	435		320	36	319
431	81	430		318	35	318
426	80	425		317	34	316
421	79	420		315	33	315
417	78	416		314	32	314
413	77	412		313	31	312
409	76	408		311	30	310
405	75	405		310	29	309
401	74	401		308	28	307
398	73	398		307	27	306
395	72	384		305	26	304
391	71	391		304	25	303
388	70	388		302	24	301
385	69	385		300	23	299
383	68	383		298	22	297
380	67	380		296	21	296
377	66	377		294	20	294
375	65	375		292	19	292
372	64	372		290	18	290
370	63	370		287	17	287
367	62	367		285	16	285
365	61	365		282	15	282
363	60	363		279	14	280
360	59	361		276	13	277
358	58	358		272	12	273
356	57	356		268	11	270
354	56	354		264	10	266
352	55	352		259	9	261
350	54 (pass)	350		254	8	256
348	53	348		250	7	250
346	52	346		250	6	250
344	51	344		250	5	250
342	50	342		250	4	250
340	49	340		250	3	250
338	48	339		250	2	250
337	47	337		250	1	250
335	46	335		250	0	250
333	45	333				

Table 6: CAHSEE Raw Score to Scale Score Conversions English Language Arts, Spring 2002						
March	**Raw Score**	**May**		**March**	**Raw Score**	**May**
450	90	450		337	44	339
450	89	450		335	43	337
450	88	450		333	42	335
450	87	450		331	41	333
450	86	450		329	40	331
450	85	450		327	39	329
449	84	450		326	38	327
443	83	446		324	37	326
437	82	441		322	36	324
432	81	436		320	35	322
428	80	431		319	34	320
423	79	427		317	33	318
420	78	423		315	32	316
416	77	419		313	31	314
413	76	415		311	30	312
409	75	412		309	29	310
406	74	409		307	28	308
403	73	406		306	27	307
400	72	403		304	26	305
397	71	400		302	25	303
395	70	397		300	24	300
392	69	395		297	23	298
389	68	392		295	22	296
387	67	389		293	21	294
384	66	387		291	20	291
382	65	384		288	19	288
379	64	382		286	18	286
377	63	380		283	17	283
375	62	377		280	16	280
372	61	375		277	15	277
370	60	373		273	14	273
368	59	370		270	13	269
366	58	368		266	12	265
363	57	366		262	11	261
361	56	364		257	10	257
359	55	362		253	9	252
357	54	360		250	8	250
355	53	358		250	7	250
353	52	356		250	6	250
350 (351)	51 (pass)	353		250	5	250
349	50	351		250	4	250
347	49 (pass)	350 (349)		250	3	250
345	48	347		250	2	250
343	47	345		250	1	250
341	46	343		250	0	250
339	45	341				